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NASA TECH BRIEF

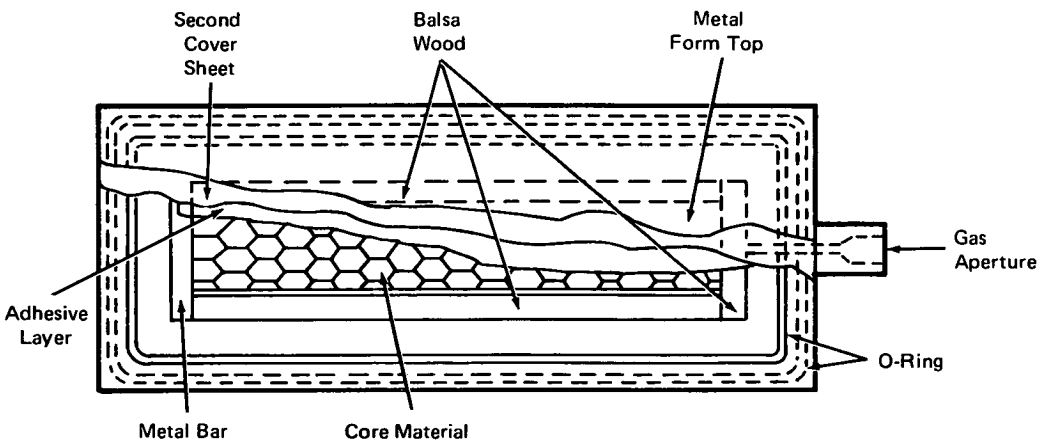
Langley Research Center

Laminating Cored, Stressed-Face, Sandwich Structures

A method has been developed for manufacturing accurate, cored, stressed-face sandwich panels which are ultralight and dimensionally stable. Structure assemblies of fragile and flexible components are rigidly supported from the aggregate exterior during the bonding operation. This support assures conformance to desired profiles and duplication of assembly results. It also minimizes exterior surface identification with core character, improving structure rigidity while adding desirable aerodynamic qualities and finish appearance. The interior or anvil constituent, gas under pressure, neutralizes the outgassing of the adhesive which minimizes its porosity, thereby resulting in a much-improved filleting action.

The illustration shows a partially broken view of a mold cavity frame with a cored, stressed-face structure in the mold cavity. In use, the frame is between the platens of a conventional hydraulic press. To fabricate a laminated article, a first cover sheet, which is larger than the opening in the side of the frame, is positioned to cover the peripheral wall. In that position the cover sheet closes one side of the open-sided frame and seals one side of the mold cavity, as it covers the O-ring gasket. A layer of adhesive film is placed over the cover sheet, and the low-density core material is then centrally located on the adhesive layer and against the metal bar in the frame mold cavity. The gap between the outer edges of the core material and the inner edges of the frame wall is filled with gas-permeable balsa wood blocks.

Another layer of adhesive film is then positioned over the core material. A second cover sheet is placed over the adhesive layer, covering the gasket in the upper surface of the frame wall and thus sealing the other side of the frame cavity. The frame is covered, and a hydraulic press pressure of 500 psi (34.5×10^5 N/m^2) is applied. The external pressure seals the mold cavity sufficiently to be gastight and causes the adhesive to be subjected to a positive pressure prior to the time that it might outgas at elevated temperatures.



Mold Cavity Frame With Cored, Stressed-Face Structure Fabrication

(continued overleaf)

Approximately 200 psi (13.8×10^5 N/m^2) of an inert gas, such as nitrogen, is introduced into the mold cavity before press platen temperature is raised sufficiently [e.g., 225° to 300° F (105° to 150° C)] to activate the adhesive. After the adhesive is set, gas pressure and platen pressure are released. The laminate is removed from the mold cavity, after trimming the second cover sheet to a size less than that of the cavity opening, and is cut to size.

To effect good lamination, the combined thickness of the adhesive and the core material should exceed the depth of the mold cavity. While a one-piece mold cavity frame has been illustrated, two-piece frames which permit the removal of the laminated article without first trimming the laminate can be used. This fabrication method could also be applied to shapes such as airfoil, conical, round, angles, and combinations thereof.

Note:

Requests for further information may be directed to:

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Patent status:

This invention has been patented by NASA (U.S. Patent No. 3,814,653). Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to:

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